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IS 4687 (1995): Gaskets and Packings - Gland Packings  
Asbestos [MED 30: Gaskets and Packing]

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( दूसरा पुनरीक्षण )

*Indian Standard*

GASKETS AND PACKINGS — GLAND  
PACKINGS ASBESTOS — SPECIFICATION

( *Second Revision* )

UDC 621-762.642.4

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BUREAU OF INDIAN STANDARDS  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

## FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Gaskets and Packings Sectional Committee had been approved by the Light Mechanical Engineering Division Council.

This standard which was originally published in 1968 was first revised in 1980. This revision has been done to modify mainly the requirements relating to the physical properties of asbestos used in the gland packings in consideration of the raw materials position in the country.

Gland packings are used to contain fluids, gases and slurries, under extreme pressures and temperatures, abrasives and other difficult conditions. This standard deals with Asbestos Gland Packing only and the requirements of other types of packings, that is, proofed cotton duck Gland Packing, and Jute and Hemp or Flax Packing are covered in separate standard.

This revision also includes a section on selection of asbestos for different service conditions.

In the preparation of this standard, assistance has been derived from the following standards:

BS 4371-1991	Specification for fibrous gland packings. British Standards Institution
GOST No. 1779-1983	Asbestos cords — Specifications Committee of Standard Measuring Instrument at the Council of Ministers of Russia
GOST No. 5152-1984	Packings — Specifications Committee of Standard Measuring Instrument at the Council of Ministers of Russia.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (revised)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## *Indian Standard*

# GASKETS AND PACKINGS — GLAND PACKINGS ASBESTOS — SPECIFICATION

*( Second Revision )*

## **1 SCOPE**

**1.1** This standard covers the requirements of gland packings made from asbestos intended to contain gases, fluids and slurries at different temperatures and pressures.

**1.2** Gland packings covered by this standard are not applicable for use in food industry.

**1.3** These packings shall be either in round or square sections.

## **2 TYPES**

**2.1** The asbestos packing shall be manufactured in the following grades:

- Type 1 Dry asbestos gland packings (excluding those for corrosive acid services),
- Type 2 Lubricated and graphited gland packings for medium pressure conditions, and
- Type 3 Lubricated and graphited gland packings for high pressure conditions.

**NOTE**— The grade of yarn specified by the standard is as per Grade A of IS 10330 : 1982. However, superior grades of yarn type AA, AAA, AAAA, may be used, depending on the service condition (see 5).

If desired by the customer, these may be supplied with a metallic wire reinforcement in each yarn by prior agreement between the purchaser and the manufacturer.

## **3 MATERIAL**

**3.1** The material for the manufacture of the three grades of asbestos gland packing shall be as follows.

### **3.1.1 Type 1**

The yarn of which these packings are composed shall be spun from long staple, white chrysotile variety of asbestos fibre free from grit or rocky matter, chalk barytes in the yarn as well as in the packing rope after drying the same and from the inclusion of spun cotton thread in the packing. The packings shall be plaited throughout from yarns reasonably uniform in appearance and thickness.

**3.1.1.1** The loss on drying two grams of material for one hour at 104°C shall not exceed 2.5 percent by weight. The further loss on ignition of the portion thus dried, determined by heating in an open crucible in a muffle furnace for 30 minutes at a temperature of  $850 \pm 25^\circ\text{C}$  shall not exceed 25 percent by weight of original undried sample. For special asbestos requirements like acid services, etc, the purchaser shall specify the acid test in his order.

### **3.1.1.2 Mass**

Mass per metre of the packing in grams shall not exceed:

$$\text{Round section } 0.825 \times d^2$$

$$\text{Square section } 0.963 \times S^2$$

where

$d$  = diameter of the packing in mm, and

$S$  = length of the side of the cross-section of the packing in mm.

### **3.1.2 Type 2**

The yarn for the manufacture of these packings shall be of the same quality as described in 3.1.1 and 3.1.1.1.

**3.1.2.1** The count of the single ply yarn shall be not coarser than 1 240 tex.

**3.1.2.2** Lubricating oil used shall be of a high grade and have an open flash point of not less than 200°C and a viscosity of not less than 36 centistokes at 98.5°C. No powders, fillers or pigments shall be added to the high grade lubricating oil with the exception of the requisite amount of graphite as specified. The lubricating oil shall be free from organic or mineral acids and also from sulphur compounds.

**3.1.2.3** Graphite used shall be flake graphite containing not less than 90 percent carbon. If desired by the user, mica may be used in place of graphite.

**3.1.2.4** Each yarn shall be previously or during the construction of the packing be steeped in or impregnated with high grade lubricating oil and graphite, so that each individual yarn shall be thoroughly treated. Only pure and original

lubricant supplied by renowned manufacturers shall be used in the packing.

**3.1.2.5** An analysis of the packing shall give results within the following mass limits:

Asbestos yarn content	: Not less than 50 percent
Lubricant	: Not more than 49 percent
Graphite	: Not more than 4 percent

**3.1.2.6** The mass per metre in grams of the packing shall not exceed:

$$\begin{aligned} \text{Round section} &: 1.37 d^2 \\ \text{Square section} &: 1.67 S^2 \end{aligned}$$

where

$d$  = diameter of the packing in mm, and

$S$  = length of the side of the cross-section of the packing in mm.

### 3.1.3 Type 3

The yarn for the manufacture of these packings shall be of the same quality as described in 3.1.1 and 3.1.1.1.

**3.1.3.1** The count of the single ply yarn shall not be coarser than 650 tex.

**3.1.3.2** The high grade lubricating oil shall be as described in 3.1.2.2.

**3.1.3.3** The graphite shall be as described in 3.1.2.3.

**3.1.3.4** The yarn shall be treated as described in 3.1.2.4.

**3.1.3.5** An analysis of the packing shall give results within the following mass limits:

Asbestos yarn content	: Not less than 64 percent
Lubricant	: Not more than 33 percent
Graphite	: Not more than 11 percent

**3.1.3.6** The mass per metre in grams of the packing shall not be more than:

$$\begin{aligned} \text{Round section} &: 1.27 d^2 \\ \text{Square section} &: 1.57 S^2 \end{aligned}$$

where

$d$  = diameter of the packing in mm, and

$S$  = length of the side of the cross-section of the packing in mm.

**3.2** The packing shall be braided in suitable lubricant which should be pure and original lubricant manufactured by renowned manufacturers and under no circumstances burnt axle oil and other substandard residue of the actual lubricant should be used in the packing.

## 4 DIMENSIONS

**4.1** The preferred dimensions for asbestos packing shall be 2, 3, 4, 5, 6, 7, 8, 10, 12, 14, 15, 16, 18, 20, 22,

25, 30, 32, 35, 38, 40, 42, 45, 48 and 50 mm. Packings of other dimensions may be supplied subject to an agreement between the purchaser and the manufacturer. The cross-section of the packing shall be circular, square or rectangular and shall be specified as given in the example below:

*Example:*

- '4 mm' circular means a packing of diameter 4 mm;
- '4 mm' square means a square packing of dimensions 4 mm  $\times$  4 mm; and
- '4  $\times$  3 mm' means a rectangular packing of length 4 mm and breadth 3 mm.

**4.2** The maximum permissible variations in dimensions shall be  $\pm 0.5$  mm for sizes up to and including 10 mm and  $\pm 1$  mm for sizes above 10 mm.

**4.3** The asbestos packings shall be manufactured in coils and the section and length of asbestos packing shall be agreed to between the manufacturer and the purchaser.

**4.4** The surface of the packing shall be smooth and it shall not have torn out threads.

## 5 SELECTION OF ASBESTOS YARN FOR GLAND PACKING

**5.1** The asbestos yarn to be used for the manufacture of gland packing will depend on the service temperature for which the gland packing is to be used. A general guideline for selection of yarn is given below:

Grade of Yarn	Asbestos Content (Percent)	Service Temperature (°C)	Loss on Ignition Approx (Percent)
A	85-90	290	25
AA	90-95	315	20
AAA	95-99	400	17
AAAA	99-100	480	14-15

## 6 DESIGNATION

**6.1** The designation of the packing shall indicate the following:

- a) Type,
- b) Dimensions of packing,
- c) Material and diameter of wire reinforcement and lubricant,
- d) Number of this standard, and
- e) Any other details as per agreement between the purchaser and the manufacturer.

## 7 SAMPLING

### 7.1 Lot

The quantity of coils of packing of the same size designation and of one definite quality, delivered to one buyer against one despatch note shall constitute a lot.

7.2 The conformity of a lot to the requirements of this standard shall be determined on the basis of the tests carried out on the samples selected from the lot.

7.3 Unless otherwise agreed to between the manufacturer and the purchaser the number of coils to be selected at random from a lot shall be in accordance with col 1 and 2 of Table 1.

**Table 1 Sample Size and Criteria for Conformity**

No. of Coils in the Lot	For Visual and Dimensional Characteristics		Sample Size for Other Characteristics
	Sample Size	Permissible No. of Defectives	
(1)	(2)	(3)	(4)
Up to 100	8	0	3
101 to 300	13	1	4
301 to 500	20	1	5
501 to 1 000	32	2	6
1 001 and above	50	3	7

7.4 The coils selected according to 7.3 shall be inspected for construction, workmanship and dimensions. If the number of coils found not in conformity with the specified requirement are less than or equal to the corresponding number given in col 3 of Table 1, the lot shall be declared conforming to the requirements of visual and dimensional characteristics.

7.5 In case of those lots which have been found satisfactory according to 7.4, the number of coils equal to the sample size given in col 4 of Table 1 shall be selected from those coils tested according to 7.4 and found satisfactory. The required test specimen cut from these coils shall be subjected to tests given in 8.2 and 8.3. The lot shall be declared conforming to the requirements of this specification if all the coils satisfy the relevant requirements.

## 8 TESTS

### 8.1 Visual and Dimensional Inspection

Each coil of packing taken in accordance with col 2 of Table 1 shall be inspected for construction, workmanship and dimensions. The dimension shall be measured to an accuracy of 0.1 mm with a slide gauge at three different places in two perpendicular

directions. The mean of the six measurements thus made shall be within the variation specified in 4.2.

### 8.2 Flexibility

A suitable length of packing when bent through 180° around the rod, the diameter of which is 4 times the thickness of the packing shall not separate into layers.

**NOTE** — For gland packing to be used under special environment the suitability of gland packing shall have to be proved for the same. The tests to be conducted and the criteria for conformity shall be agreed to between the manufacturer and the purchaser.

### 8.3 Determination of Lubricant Content

#### 8.3.1 Lubricant Content

Unplait a representative section of the packing not less than 5 g weight, taking care to collect all pieces which are dislodged. Place a Soxhlet thimble in a weighing bottle and with the lid offset, place in an oven at 105 to 110°C, replace the lid, cool in a desiccator to room temperature and weigh ( $W_1$ ).

Transfer the sample reprepared as above to the Soxhlet thimble and replace in the oven for 1 hour as before. Cool in a desiccator to room temperature and weigh ( $W_2$ ), place the dried sample in a vapour jacketed Soxhlet extraction apparatus and extract for one hour with carbon tetrachloride. The volume of solvent to be used shall be at least three times the volume of the Soxhlet liner.

#### 8.3.1.1 Grease, oil and binder content

Dry an evaporating basin in an oven at 105°C, cool to room temperature and weigh ( $W_3$ ). Transfer the solution from the extraction flask to the basin and evaporate off the solvent. Place the basin and its content in an oven for half an hour at 105°C, cool to room temperature and weigh ( $W_4$ ).

$$\text{Grease, oil or binder content, percent} = \frac{W_4 - W_3}{W_2 - W_1} \times 100$$

#### 8.3.2 Graphite Content

Dry the Soxhlet thimble and its contents in an oven. Carefully remove the extracted yarn from the Soxhlet thimble on to a sheet of clean, smooth paper. Dislodge the graphite flasks by gently untwisting the yarn. Return the graphite to the thimble. Replace the thimble in the weighing bottle used originally and replace in an oven for one hour. Cool to room temperature and reweigh ( $W_5$ ).

$$\text{Graphite content, percent} = \frac{W_5 - W_1}{W_2 - W_1} \times 100$$

8.3.3 The asbestos yarn content shall be 100 minus lubricant content and graphite content and after determining this factor, the yarn shall be tested to ascertain the suitability according to 3.1.1.1.

## 9 MARKING

9.1 Each coil of packing shall be marked with the following:

- a) Indication of the source of manufacture,
- b) Dimension of packing,
- c) Grade of packing, and
- d) Year and month of manufacture.

## 9.2 BIS Certification Marking

The product may also be marked with the Standard Mark.

9.2.1 The use of the Standard Mark is governed by the provisions of Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## 10 PACKAGING

10.1 Packaging shall be as agreed between the manufacturer and the purchaser.

**Bureau of Indian Standards**

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